# Inclusive Transport for Cities

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# Energy and Equity

*"…equity and energy can grow concurrently only to a point. Below a threshold of per capita wattage, motors [transportation] improve the conditions for social progress. Above this threshold, energy [use] grows at the expense of equity."*

- Ivan Illich, 'Energy and Equity', 1973.

# Inclusive (transport) planning process

- **Including all social groups while…**
  - Collecting data
  - Documenting opinions
  - Preparing plans
  - Sharing and debating plans
  - Implementing plans
    - Minimizing displacements and managing resettlement
  - Monitoring implementation
  - Evaluating plans, replicating ‘best practices’

# Inclusive Low-carbon Mobility Plans

- LCMP should not only measure/model 'mobility' but also analyze 'mobility constraints' (or lack of accessibility) in order to plan for them.

- Mobility constraints can be defined by…
  - Affordability
  - Location
  - Social groups (gender, caste etc.)
  - Occupation (i.e. on-foot street vendors etc.)
  - Modes (walking, cycling)

# Inclusive BRT system

- Safe(r) physical access to the bus stops
- Easy boarding to the bus
- Dedicated bus corridors with NMT infrastructure
- Priority to the bus-cycling-walking in road space and in the junction design
- Seamless transit between public modes (buses, rickshaws, rail)
- Equally good quality of walking-cycling infrastructure and lighting
- Affordable fares
- Road-ways integrating the street-hawking activities
- Minimizing project displacements and rehabilitation that improves people's life.

# BRT Case-studies

| NO. | City | Stage of implementation | Operation started | Planned network (Km) | Length of corridors approved by MoUD | Peak hour average speed (Km/hr.) | Frequency of buses (seconds /direction) | Existing Ridership (persons/ hour/ direction) | Planned ridership (persons/ hour/ direction) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Delhi | 5.6 km operational | Apr-08 | 426 | NA | 16-19 | 30-45 | 9000-10000 | 20,000-24,001 |
| 2 | Pune | 17 km operational | Dec-06 | 117 | 117 | 16-18 | 45-60 | 3,600 | 10,000-15,000 |
| 3 | Jaipur | 10 km operational | Partly started | 138 | 42 | 25 | 120-300 | 500-1,700 | - |
| 4 | Indore | 11.5 km under construction | Not yet started | 106 | 11.5 | 20 (expected) | 150 (planned) | 1,000-4,000 | 10,000-20,000 |
| **5** | **Ahmedabad** | **45 km operational** | **Jul-09** | **200** | **88.8** | **22-25** | **180-300** | **1500-3000** | **15,000-20,000** |

# AHMEDABAD: CITY CHARACTERISTICS

- 7th largest urban agglomeration and 7.5 millions (5.5 millions municipal population)
- Area: 490 sq kms
- 1.4 millions vehicles growing at the rate of 0.1 million every year.
- Almost 1 million passengers use buses (0.86 m municipal buses + 0.14 m BRT)
- Avg trip length 5.8 kms.
- 61% affected modes in fatal accidents are pedestrians and cyclists

# JANMARG- Ahm BRTS

- It is a median bus lane type BRT system, which runs exclusive buses on the corridor.
- Ticketing is done on the stations. (Pre-boarding)
- It is managed by a Special Purpose company
- Buses are owned and operated by a private operators.

- Ahmedabad BRTS Project (Janmarg) construction started in the Year 2007 and the first phase of 12.5 Kms. was opened in October 2009 and 45 kms of network so far.
- The cost of the Project is Rs. 9.5 billion
- The total revenue collection is an average Rs. 7,30,000 daily.
- 78 Buses are catering more than 1,40,000 passengers everyday during 6:00 a.m. to 11:30 p.m.

# Ahmedabad BRT System



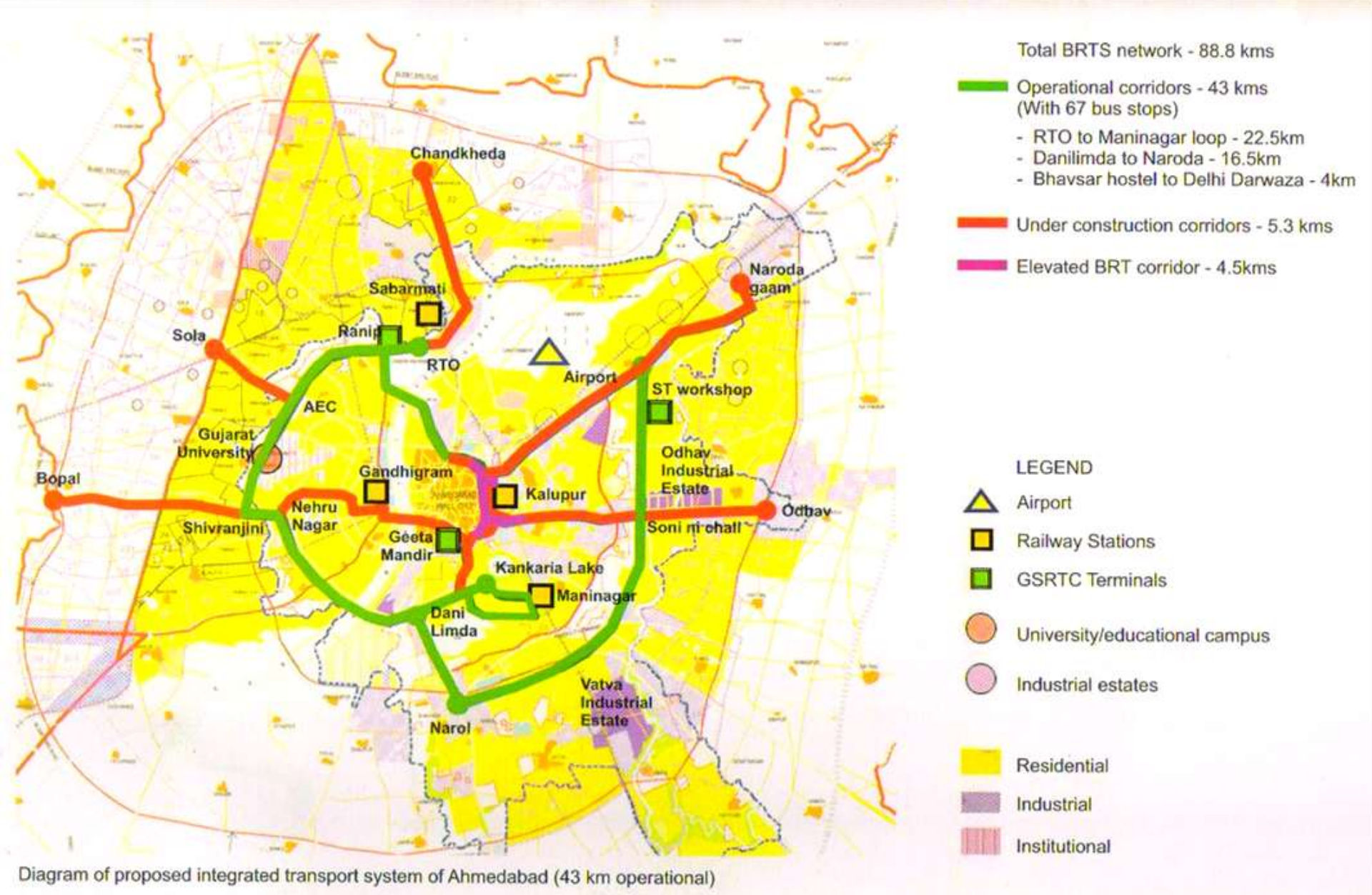



Diagram of proposed integrated transport system of Ahmedabad (43 km operational)

Source: Ahmedabad Municipal Corporation's Brochure for JANMARG (2011)

**OPERATIONAL & UNDER CONSTRUCTION JANMARG ROUTES FOR AHMEDABAD**

***"A large proportion of the population either walks or use bicycle. Hence needs for improvements in related facilities are a necessity."***

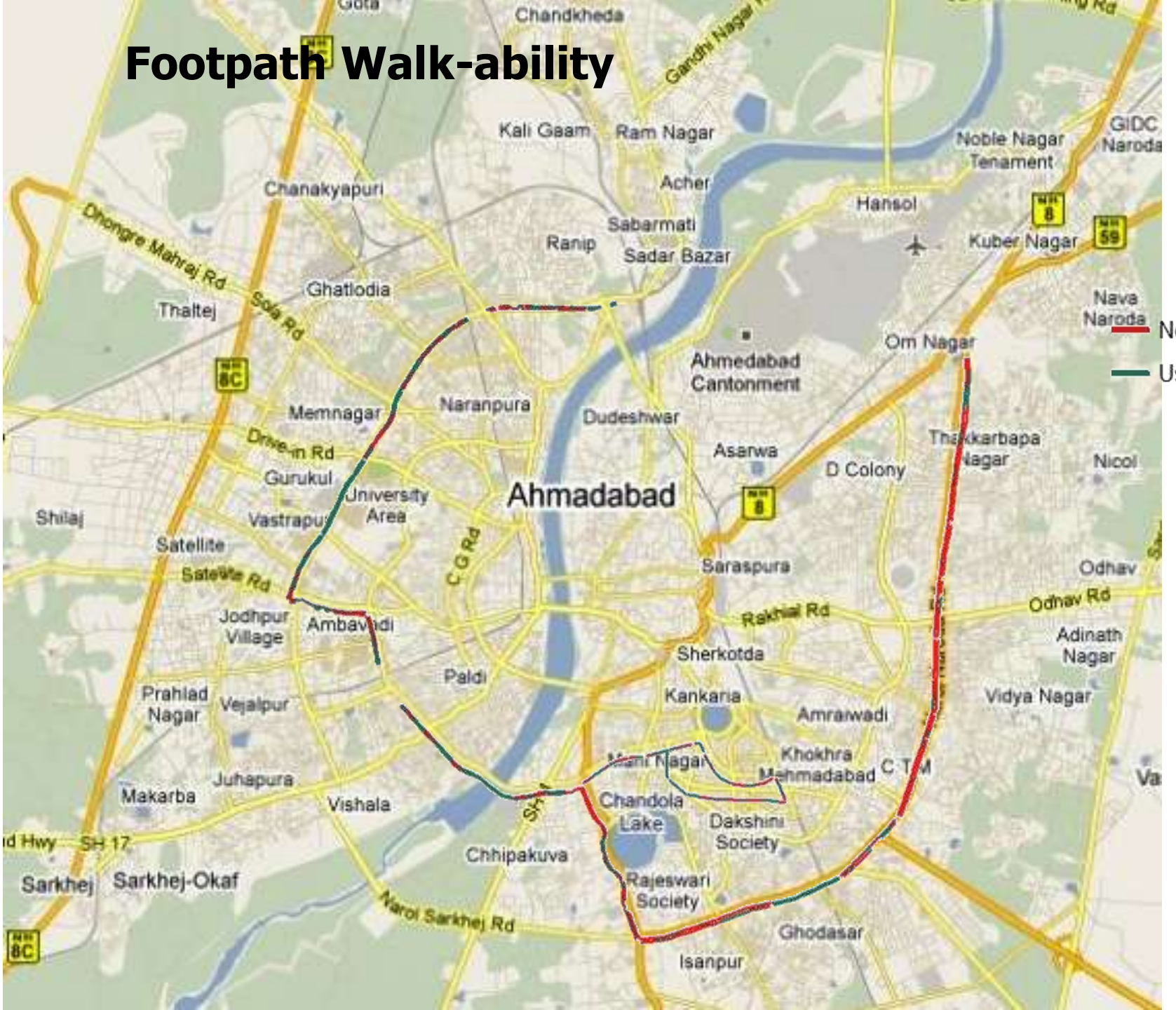
*-Ahmedabad BRT DPR-1 (2006), pp 19.*

# Walking and cycling infrastructure in BRT Ahmedabad

# BRT Operational Route

# Footpath Availability

# Footpath Walk-ability



# Cycle Track Availability

# Cycle Track Usability

# BRT Pedestrian Route: AHMEDABAD

# BRT Cycle Track: AHMEDABAD

# Cycle Track and footpath on BRT Route: AHMEDABAD


Discontinuous cycle track visible

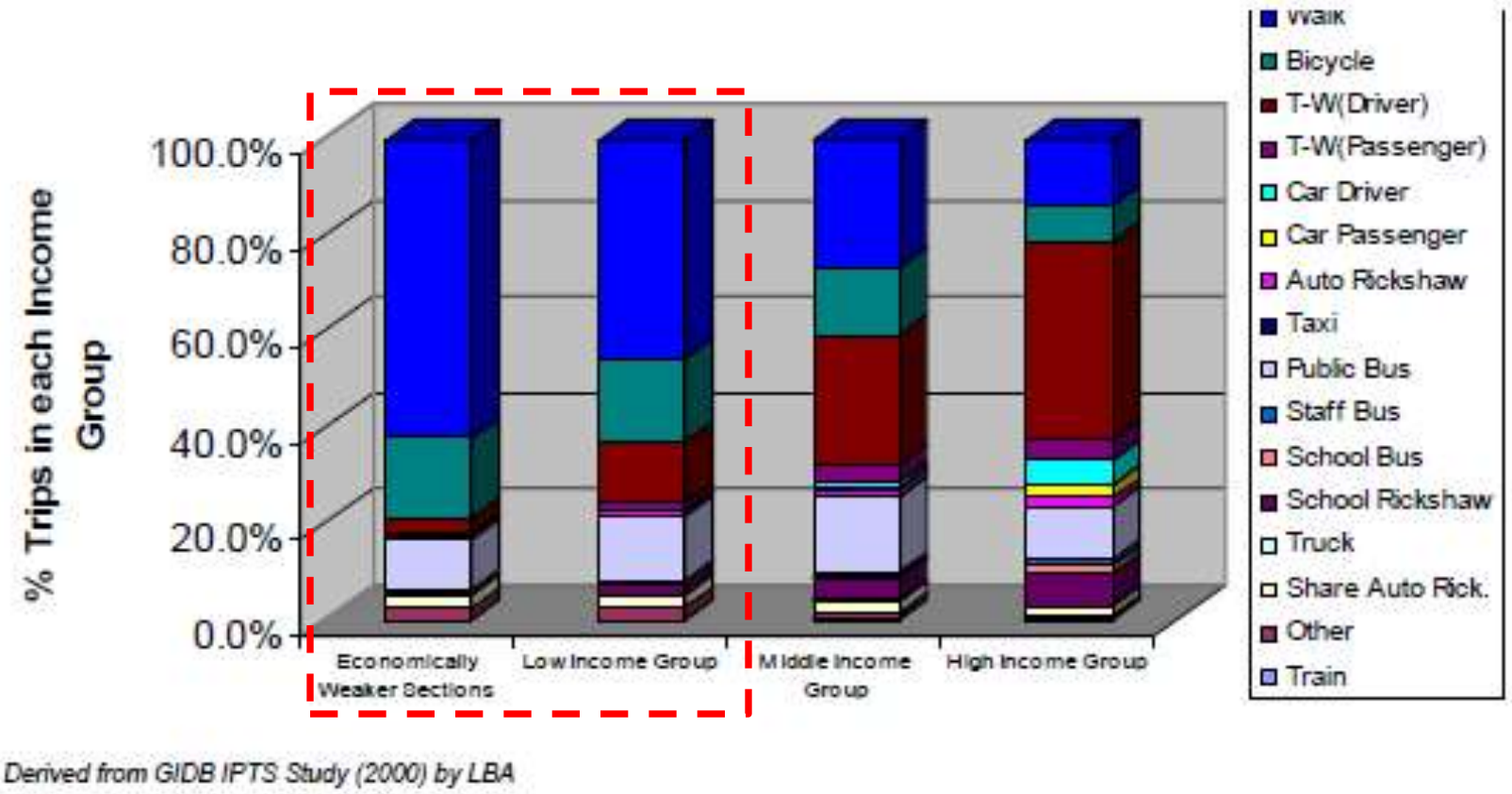
Legend

- BRT_Stand
- Footpath
- Cycle_Track
- BRT_Road

0 50 100 200 300 400 Meters

# BRT without walking-cycling?

Fig 5-3: Mode Choice and Household Income




*Derived from GIDB IPTS Study (2000) by LBA*

***Almost 80% of EWS (economically weaker section) and 60% of LIG Households Walk or cycle in the city, and therefore require better NMT Infrastructure to be included in the city level transport infrastructure.***

**(Source: BRT Detailed project report-1)**

# BRTS cycle-track discarded over space, security concerns

TIMES NEWS NETWORK

**Ahmedabad:** If you had plans for a morning bicycle ride along the BRTS stretch from Shivranjani to SG Highway, you will be disappointed. AMC has decided to do away with the cycle track on this stretch which is supposed to run alongside the BRTS track.

The reasons cited were non-availability of land and security issues since it next to ISRO' Space Applications Centre. The bus stops here also have deliberately planned far away from the high security zones. Officials said that one bus stand will be somewhere near Jodhpur crossroads and the next at Ramdevnagar crossroads.

The official also said that AMC was not willing to take any chances. "Anyone can stand at a BRTS bus station and take photographs and hence we wanted to be sure. Those who would be riding bicycles would have to do it very close to the boundary wall. This was also a security threat to the establishment."

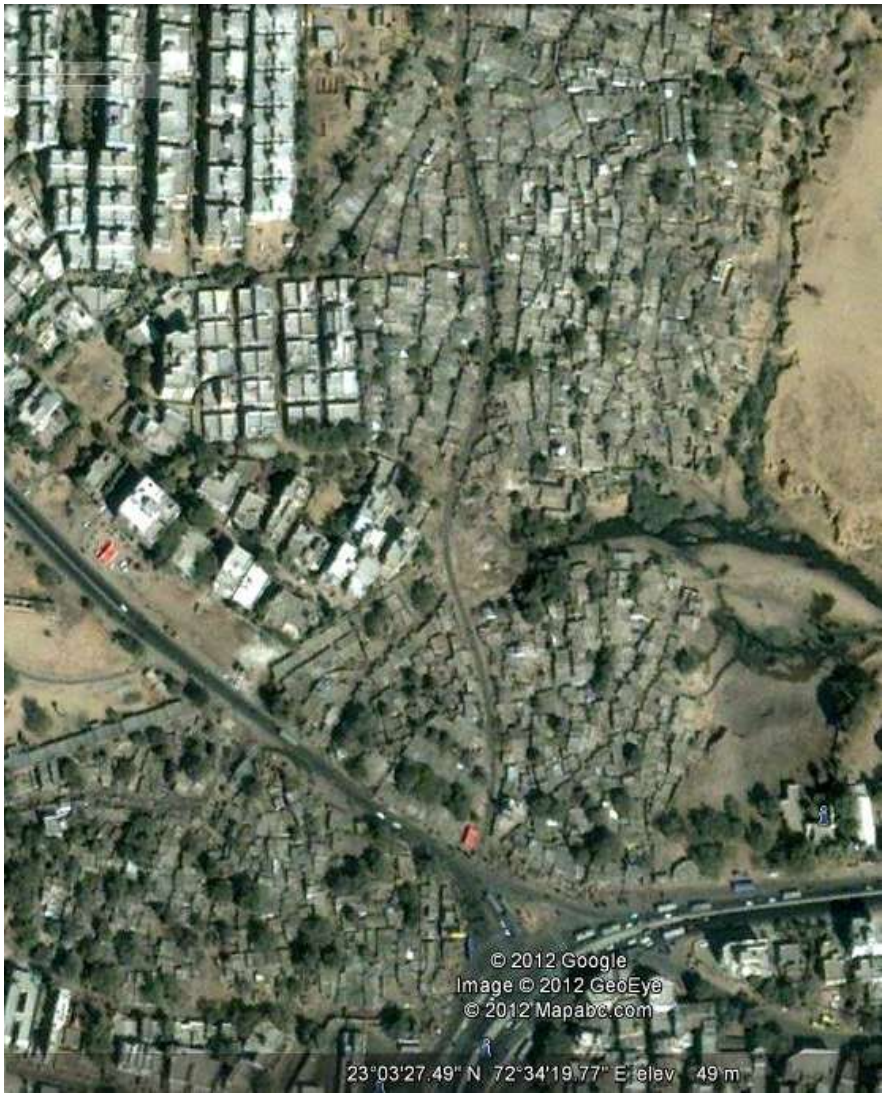
Another reason was simply the lack of space. This area has among the highest densities of cars and two wheelers passing by. He said that AMC had asked for some land from ISRO, but since it was a Government of India organization, there was a delay in getting the land and there was also no positive reply also from the Government. Officials thought it best to do away the bicycle track.

The revised road boundary being marked out adjacent to the ISRO wall on the Jodhpur Ramdevnagar stretch

U C Padia, deputy municipal commissioner said "We had demanded land from ISRO, but since ISRO is a Government of India establishment, there was a delay. Hence we decided to do away with the bicycle track and have also taken a decision to narrow the pedestrian lane near the ISRO boundary to have more space for mixed traffic."

Another senior officer said other factors leading to the decision to do away with the track were a nearby school and temple, apart from parking by private luxury buses were major hindrances to traffic on the stretch. The school and the temple have visitors parking their vehicles right on the road, while the luxury buses also park on the main road at night.

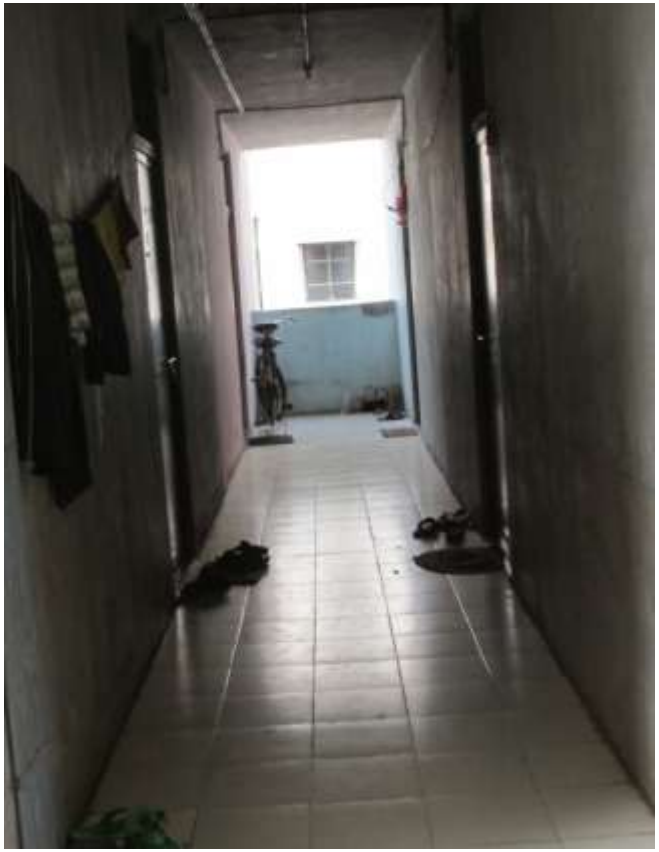
# Displacement BRT/Road widening




**Jan-Feb 2010**


**May 2010**

# Resettlement Colonies

**Basic services for the urban poor?**

# BRT users in Ahmedabad

# BRT User survey – Modal shift, cost

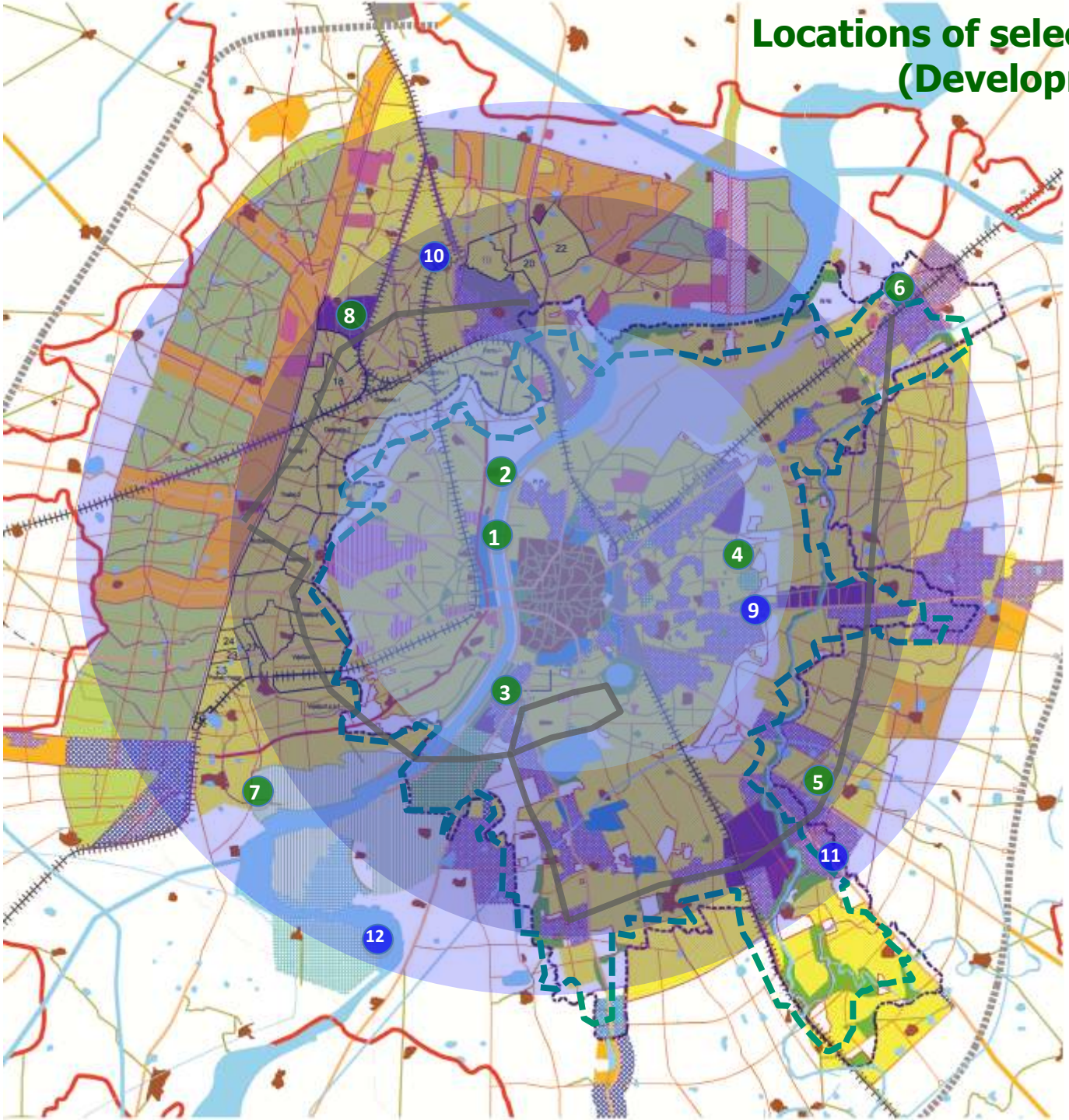
| | Trip cost and lengths | |
|---|---|---|
| 1 | Average cost per BRT trip (Rs and USD) | Rs. 6.73/ USD 0.15 |
| 2 | Median cost per BRT trip (Rs and USD) | Rs. 5.00/ USD 0.11 |
| 3 | Average trip length by BRT (km) | **8.7** |
| 4 | Median trip length by BRT (km) | **6.9** |
| 5 | Average trip length (km) on BRT + access-egress | **12.92** |
| 6 | Median trip length (km) on BRT + access-egress | **10.84** |
| | **Modal Shift** | |
| 7 | Modal shift from AMTS to BRTS (%) | **46.8** |
| 8 | Modal shift from shared autorickshaw to BRTS (%) | **12.9** |
| 9 | Modal shift from full-fare autorickshaw to BRTS (%) | **13.1** |
| 10 | Modal shift from motorized two-wheeler to BRTS (%) | **10.2** |

# BRT User survey – Income, Employment, Purpose

| | Indicators | Male | Female | Sex ratio |
|---|---|---|---|---|
| | **Income groups of the users** | | | |
| 1 | % among users with income less than Rs. 5,000 pm | 14.4 | 11.5 | 244 |
| 2 | % among users with income more than Rs. 40,000 pm | 10.9 | 16.8 | 585 |
| | **Age group** | | | |
| 3 | % among users in age group 15-40 years | 75.9 | 73.8 | 369 |
| | **Employment** | | | |
| 4 | % workers among BRT users | 71.8 | 42.7 | 226 |
| 5 | % among users who are casually employed | 6.1 | 3.3 | 121 |
| 6 | % among users regularly employed in public sector | 8.1 | 18.0 | 500 |
| 7 | % among users regularly employed in private sector | 63.8 | 65.6 | 232 |
| | **Trip purpose** | | | |
| 8 | % using BRT for work | 55.4 | 35.0 | 239 |
| 9 | % using BRT for education | 15.8 | 19.6 | 471 |

# Mobility of the urban poor in Ahmedabad

# Locations of selected settlements (Development plan 2011)





Settlements studied

Rehabilitation settlements studied

BRT Route

(for reference only)

# Quantitative Sampling

| | Name of Major Settlements surveyed | Slum settlement type/ location | Ward | Zone | No of Hh in settlement | Sample surveyed |
|---|---|---|---|---|---|---|
| **Core City Slums** | | | | | | |
| 1 | Municipal quarters | Central core | Shahpur | Central | 310 | 29 |
| 2 | Khanpur darwaja | Central core | Khanpur | Central | 500 | 47 |
| 3 | Baba Lavlavi Nagar, Ramji mandirni chali | Southern Core city | Baherampura | South | 750 | 64 |
| 4 | Lalluramni chali, Damodarni chali | Eastern Core city | Rakhial | East | 1097 | 98 |
| | | | | | Total | 238 |
| **Periphery slums** | | | | | | |
| 5 | Hanuman Nagar, CTM | Industrial suburban South-Eastern Periphery | Bagefirdos | South | 320 | 29 |
| 6 | Santoshinagarna chhapara | Industrial suburban Northern Periphery | Naroda-muthiya | North | 1040 | 52 |
| 7 | Yogeshwar nagar-1 | Western periphery | Vasana | West | 450 | 29 |
| 8 | Sanjay Nagar Na Chhapara | Western intermediate | Naranpura | West | 975 | 59 |
| | | | | | Total | 169 |
| **Relocation-Resettlement sites** | | | | | | |
| 9 | Ajit Mill Ni Chali , Rakhial | Core city Rehabilitation | Rakhial | East | 704 | 30 |
| 10 | Balol Nagar BSUP | Western Rehabilitation | Near Akbar Nagar | West | 640 | 35 |
| 11 | BSUP Housing, Trikampura | Eastern Rehabilitation | Jasodanagar | South east | 672 | 54 |
| 12 | Ganesh Nagar, Piplaj | Temporary rehabilitation site (south) | Piplaj | South | 600 | 54 |
| | | | | | Total | 173 |
| | | | | | Grand Total | 580 |

# H/h surveys in progress

# Sample description

- 580 households, 3002 people – H/h size of 5.2
- Sex ratio 853 (females/1000 males)
  - National avg 926 (2001)
- 73.2% literacy rate (read and write).
- 39.9% regular employment (salaried), 29.7% self-employed, 30.5% casual labour (daily wage)
- average monthly household income is Rs. 6,049 (Ahm city avg Rs 8728) - 85% of sample would fall under official poverty line of 32 Rs/capita/month
- 3,419 trips - 1253 by females and 2166 by males

| Age group | % of sample |
|---|---|
| **Female** | **46.5** |
| Upto 14 | 13.0 |
| 15-40 | 24.8 |
| 41-59 | 6.6 |
| 60 & above | 2.1 |
| **Male** | **53.5** |
| Upto 14 | 15.6 |
| 15-40 | 27.8 |
| 41-59 | 7.1 |
| 60 & above | 3.0 |
| **Total** | **100.0** |

# Mode usage (%)

| Sex | Walking | Cycle | Hand cart/ paddle rickshaw | Public bus | Shared auto rickshaw | BRTS | Multiple modes | M2W | Auto rickshaw | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|
| Female | 58.9 | 1.8 | 0.7 | 8.7 | 16.3 | 0.2 | 9.9 | 0.8 | 2.6 | 100.0 |
| Male | 29.7 | 19.5 | 2.7 | 11.8 | 15.6 | 0.5 | 11.7 | 5.0 | 3.6 | 100.0 |
| **Overall** | **40.4** | **13.0** | **2.0** | **10.7** | **15.8** | **0.4** | **11.0** | **3.5** | **3.2** | **100.0** |
| | **Non-motorized modes = 55.4** | | | **Public/ shared modes = 26.9** | | | **Private modes = 6.7** | | | 100.0 |

| Mode share in earlier studies | Walking | Cycle | Public bus | Shared auto rickshaw | M2W | Auto rickshaw | Car-van | Others | Total |
|---|---|---|---|---|---|---|---|---|---|
| LB-IPTS study 2000 [1] | 37.6 | 17.6 | 8.4 | 5.7 | 25.3 | 2.5 | 2.5 | 0.3 | 100.0 |
| AMC-CEPT 2006 [2] | 13.2 | 18.8 | 15.0 | - | 35.0 | 8.8* | 3.1 | 5.8 | 100.0 |

Notes: * Shared auto rickshaw is assumed to be part of this as it is not mentioned separately.
1 As quoted by AMC et al, 2007 (Detailed Project report for BRTS Phase -1)
2 As quoted by AMC, 2008 (Detailed Project report for BRTS Phase -2)

# Travel distance (%)

| Distance Traveled | Less than 1 Km | 1.1 to 3 Kms | 3.1-5 Kms | 5.1-7 Kms | 7.1-9 Kms | 9.1and above | Grand Total |
|---|---|---|---|---|---|---|---|
| Female | 42 | 30 | 10 | 7 | 3 | 7 | 100 |
| Male | 24 | 27 | 15 | 9 | 7 | 18 | 100 |
| **Over all** | **31** | **28** | **13** | **8** | **6** | **14** | **100** |
| | | | | | | | |
| **(City – level)** LB-IPTS study 2000 | 13.0 | 43.1 | 12.9 | 8.3 | 7.0 | 15.5 | 100.0 |

# Mode/Trip distances (%)

| All trips | Walking | Cycle | Hand cart/ paddle rickshaw | Public bus | Shared auto rickshaw | BRT | Multiple modes | M2W | Auto rick. | Average trip length |
|---|---|---|---|---|---|---|---|---|---|---|
| Female | 1.36 | 2.90 | 3.33 | 5.24 | 4.77 | 1.50 | 7.98 | 6.88 | 3.39 | 2.88 |
| Male | 1.35 | 4.86 | 5.08 | 9.34 | 6.12 | 4.75 | 9.39 | 7.07 | 5.96 | 5.10 |
| Overall | 1.36 | 4.77 | 4.84 | 8.14 | 5.70 | 4.39 | 8.99 | 7.06 | 5.24 | 4.35 |
| Mode wise trip lengths in city level studies | | | | | | | | | | |
| LB-IPTS study 2000 | 0.9 | 3.6 | - | 12 | 5.3 | - | - | 6.8 | 5.1 | 4.6 |
| AMC-CEPT '06[1] | 2 | 3 | - | - | - | - | - | - | - | 5.5 |
| [1] – Only trips exceeding 1 Km are considered as a 'trip' for this study. | | | | | | | | | | |

# Trip expenses

| Sex | Expense per trip (in Rs.) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Nil | 01-05 | 06-10 | 11-15 | 16-20 | 20+ | Grand Total |
| Female | **63** | 17 | 13 | 3 | 1 | 2 | 100 |
| Male | **54** | 15 | 17 | 5 | 2 | 6 | 100 |
| Over all | **58** | 16 | 15 | 5 | 2 | 4 | 100 |

# Modal split by locations

| | Walking | Cycle | Hand Cart/ Paddle Rickshaw | Municipal bus | Shared Auto Rickshaw | BRT | M2W | Auto Rick. | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Core City Slums** | | | | | | | | | |
| Female | 66 | 3 | 1 | 10 | 16 | 0 | 1 | 3 | 100 |
| Male | 40 | 26 | 6 | 8 | 12 | 0 | 6 | 2 | 100 |
| **Over all** | **50** | **17** | **4** | **9** | **14** | **0** | **4** | **2** | **100** |
| **Peripheral Slums** | | | | | | | | | |
| Female | 77 | 1 | 0 | 6 | 12 | 1 | 1 | 2 | 100 |
| Male | 33 | 21 | 1 | 15 | 17 | 2 | 4 | 7 | 100 |
| **Over all** | **48** | **14** | **0** | **12** | **16** | **1** | **3** | **5** | **100** |
| **Resettlement Sites** | | | | | | | | | |
| Female | 52 | 2 | 1 | 13 | 27 | 0 | 1 | 4 | 100 |
| Male | 22 | 17 | 1 | 20 | 27 | 0 | 8 | 4 | 100 |
| **Over all** | **34** | **11** | **1** | **17** | **27** | **0** | **5** | **4** | **100** |

# Mode wise trip distance/locations

| Trips <4 days/ week | Walking | Cycle | Hand Cart/ Paddle Rickshaw | Municipal Bus | Shared Auto Rickshaw | BRTS | M2W | Auto Rick. |
|---|---|---|---|---|---|---|---|---|
| All settlements | | | | | | | | |
| Female | 1.4 | 2.9 | 3.3 | 5.2 | 4.8 | 1.5 | 6.9 | 3.4 |
| Male | 1.4 | 4.9 | 5.1 | 9.3 | 6.1 | 4.8 | 7.1 | 6.0 |
| **Overall** | **1.4** | **4.8** | **4.8** | **8.1** | **5.7** | **4.4** | **7.1** | **5.2** |
| Rehabilitation Sites | | | | | | | | |
| Female | 1.1 | 2.8 | 2.0 | 6.6 | 6.5 | 0.0 | 10.0 | 4.3 |
| Male | 1.5 | 8.0 | 5.5 | 10.8 | 7.5 | 0.0 | 10.3 | 4.9 |
| **Overall** | **1.3** | **7.6** | **4.3** | **9.5** | **7.2** | **0.0** | **10.3** | **4.7** |

# Policy recommendation and conclusions

- **First level of issues are the implementation of the BRT projects**
  - lack of interest in the city administrations to implement such complex projects on a long-term basis
  - lack of coordination amongst various government agencies
  - lack of effective monitoring from the national government

How to turn around this is a major policy challenge!

- **Second level of issues are building selective infrastructure.**
  - BRT as a system of low-carbon mobility consisting of walking, cycling infrastructure and parking management not only as a central verge infrastructure.

- How to move towards low-carbon mobility?
  - The foremost policy recommendation is to actively follow and implement the objectives of the National Urban Transport Policy (NUTP).

# Ending with 'Energy and Equity'

*"Liberation from the radical monopoly of the transportation industry is possible only through…*

- *the institution of a political process that demystifies and disestablishes speed &*
- *limits traffic-related public expenditures of money, time, and space*

*to the **pursuit of equal mutual access**."*

*"Participatory democracy demands **low-energy technology**, and free people must travel the road to productive social relations **at the speed of a bicycle**."*

- Ivan Illich, 'Energy and Equity', 1973.

# Thank You